

(12) **United States Patent**
McGuckin et al.

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(54) **MULTI-DIRECTIONAL NEEDLE MEDICAL DEVICE**

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(List continued on next page.)

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 77 days.

G.R. Zadno and T.W. Duerig: Linear Superelasticity in Cold-Worked Ni-Ti; Engineering Aspects of Shape Memory Alloys, pp. 414-419.

(21) Appl. No.: **09/668,067**

Allan Siperstein, M.D. et al., Liver Tumor Ablation Program: University of California, San Francisco / Mount Zion Medical Center.

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Related U.S. Application Data

Website printout—<http://www.daum.de/mri/softtissue/smartguide.html>; "SmartGuide™ CT/MRI"; (date unknown); two pages; Daum Corp., Chicago, IL.

(62) Division of application No. 09/457,844, filed on Dec. 9, 1999.

U.S. application No. 09/377,293 filed Aug. 19, 1999 (Abstract and Drawings Only).

(60) Provisional application No. 60/130,597, filed on Apr. 22, 1999, and provisional application No. 60/111,624, filed on Dec. 9, 1998.

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(51) **Int. Cl.**⁷ **A61M 5/32**

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(57) **ABSTRACT**

(58) **Field of Search** 604/272, 204, 604/117, 273, 274, 93.01

A needle assembly (70) comprising an infusion needle (11) that includes a plurality of needle cannulae (13) made of a superelastic material such as nitinol. The needle cannulae are cold-worked or heat annealed to produce preformed bends (16) that can be straightened with in passageway (21) of a coaxial outer cannula (12) for introduction into the body of a patient. Upon deployment from the outer cannula, the needle cannulae substantially return to their preformed configurations for the introduction or extraction of materials at areas lateral to the entry path of the needle assembly. The plurality of needle cannulae (13) can be variably arranged or configured for their distal tip portions to attain a desired infusion pattern such as an umbrella shaped array (75), and/or be staggered axially.

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23 Claims, 11 Drawing Sheets

